

Leveraging the Local to Go Global:

- *Citizen Scientists
Exploring the Drivers
of Eutrophication*

Diana Eddowes, Ian Thornhill
and Rita Galdos

FRESHWATER WATCH

Citizen scientists researching water quality on global and local scales



FRESHWATER WATCH PARTNERS



Enthusiastic and
engaging team of
scientists



GLOBAL RESEARCH PARAMETERS

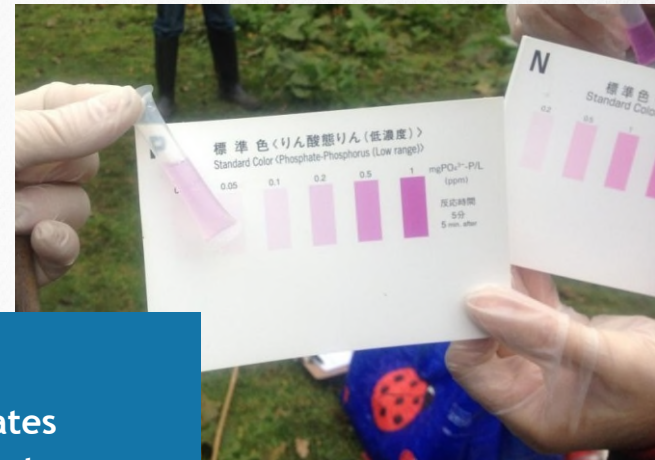
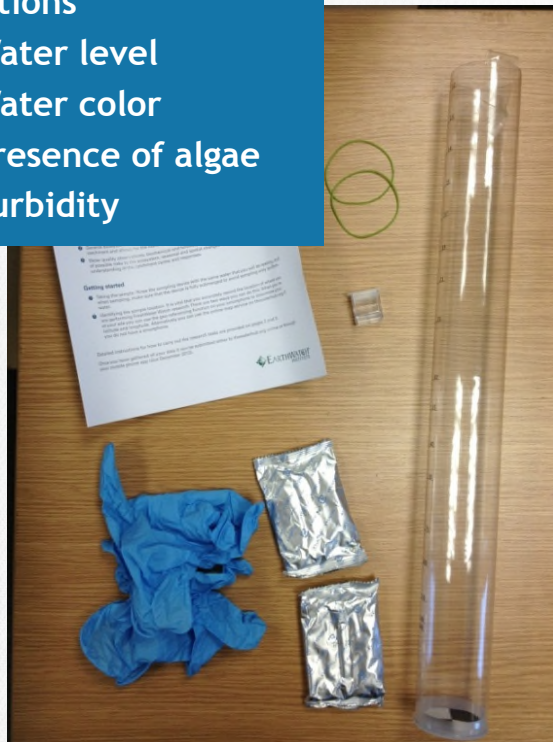


Ecosystem observations

- ❖ Bank vegetation
- ❖ Wildlife present
- ❖ Pollution sources

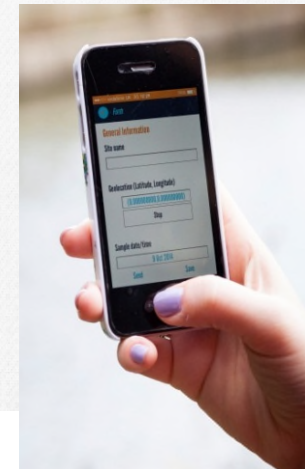
Water conditions

- ❖ Water level
- ❖ Water color
- ❖ Presence of algae
- ❖ Turbidity




Nutrients



- ❖ Nitrates
- ❖ Phosphates



FRESHWATER WATCH ONLINE


FreshWaterWatch


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-WELCOME TO FRESHWATER WATCH-

An **Earthwatch** research project investigating the health of global freshwater ecosystems


FreshWaterWatch

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CHINOOK SALMON RETURN TO WEST VANCOUVER CREEK


 **rod.d.mackinnon**
Originally posted: 23/11/14 12:11 am

Chinook Salmon return to West Vancouver Creek

An article in the Nov 12 issue of the 'North Shore News' paper reported that Chinook salmon have begun spawning in Brothers Creek. This is the first time they have ever been seen here. Brothers Creek feeds into the river that I test regularly (Capilano River). Turbidity levels have been high in my Oct and Nov samples and this was likely due to a series of mudslides north of Capilano Lake in October.


[Read more](#) [rod.d.mackinnon's blog](#) [1 comment](#) [Add new comment](#)

GREAT INFORMATION ON FRESHWATER ISSUES FROM CIRCLE OF BLUE

 **areggio**
Originally posted: 16/11/14 02:11 pm

I receive weekly emails from [Circle of Blue](#), a great resource for current news and information on the world's resource crises with a focus on water. Today's email included two articles about water that caught my attention as they relate directly to information we cover during the Freshwater Challenge on the CSL Training Days. It's great to read information which connect climate change issues


to date. **CLICK HERE.**

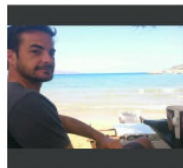


to 30% of the nitrogen that is
modern agriculture ends up in our
water.

YOU CAN MAKE THE DIFFERENCE. JOIN OUR GLOBAL COMMUNITY OF CITIZEN SCIENTISTS TO HELP PROTECT OUR FRESHWATER RESOURCES.

GET INVOLVED!



FreshWaterWatch



nbail

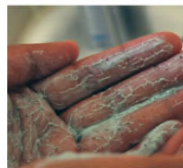
YOUR CURRENT STATUS IS:
ROOKIE

LATEST NEWS




10,000 Water Quality Tests for FreshWater Watch

Earthwatch is celebrating its FreshWater Watch programme reaching the 10,000th water quality measurement taken by one of hundreds of citizen...




Microbeads Banned in New York

Buffalo, NY, Erie County, New York State FreshWater Watch partners in the USA, the Alliance for the Great Lakes, has achieved a big win for...




"I am a Citizen Scientist" video highlights the joy of our volunteers


MY RATINGS



COMMUNICATION
-390

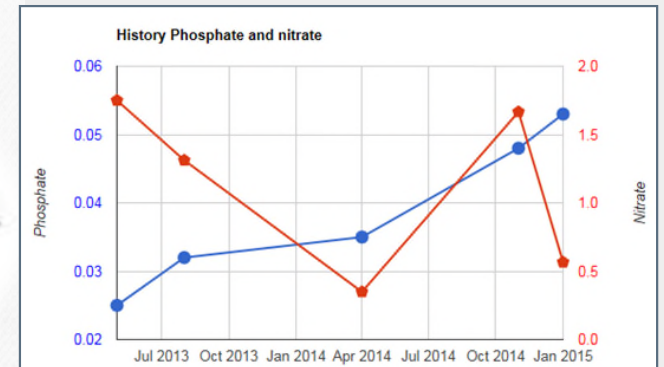
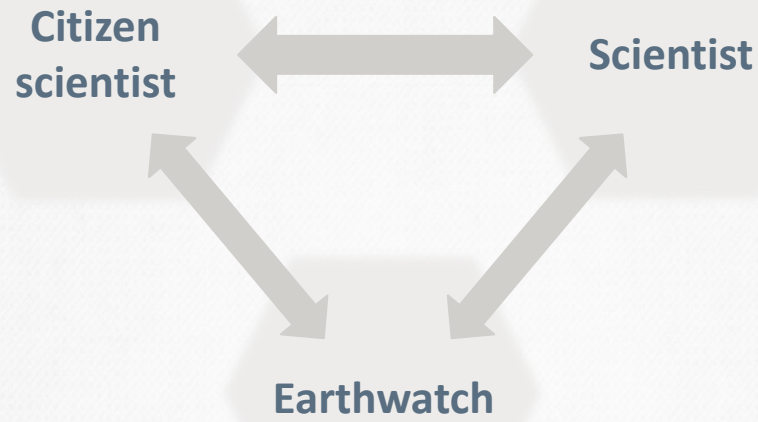
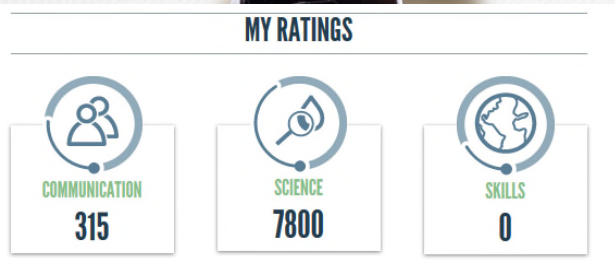


SCIENCE
-45



SKILLS
144

CONTINUED ENGAGEMENT



ACTION WORLDWIDE

FreshWater Watch has projects in 36 locations around the world.



Raising awareness
Pollution cleanup



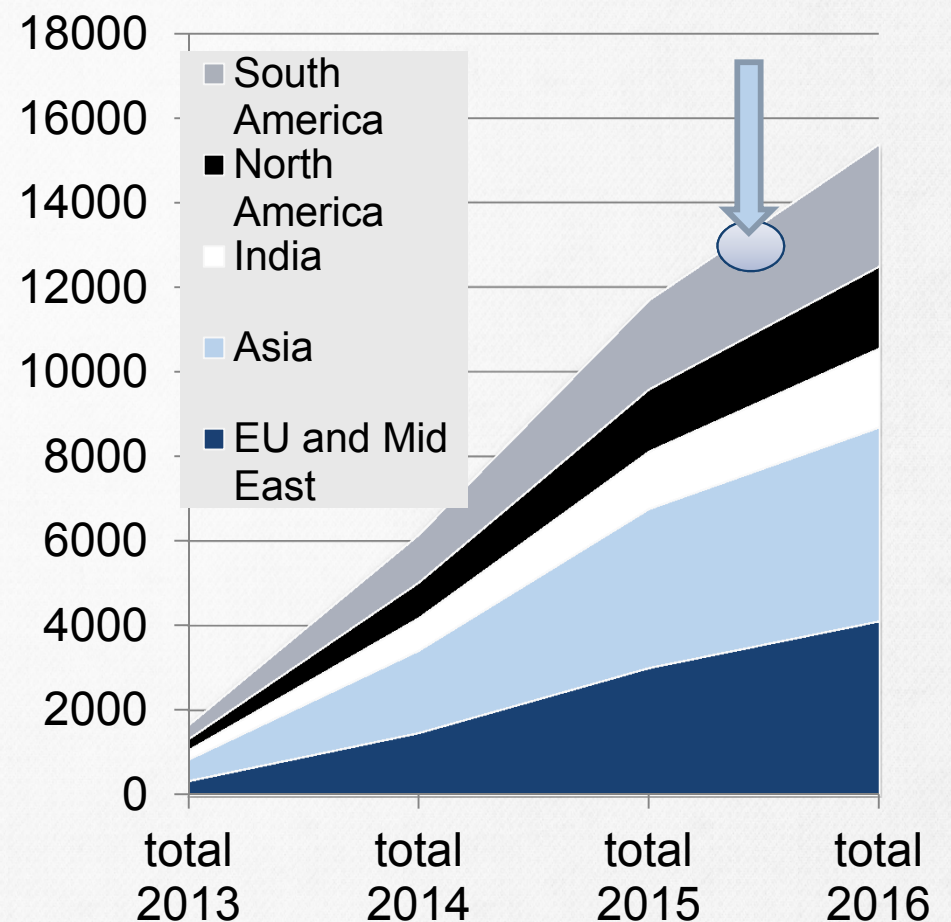
RESULTS TO DATE

Since 2012 worldwide we have:

- Held **423 CSL** training events
- Trained **7515** CSLs of which **24%** are active



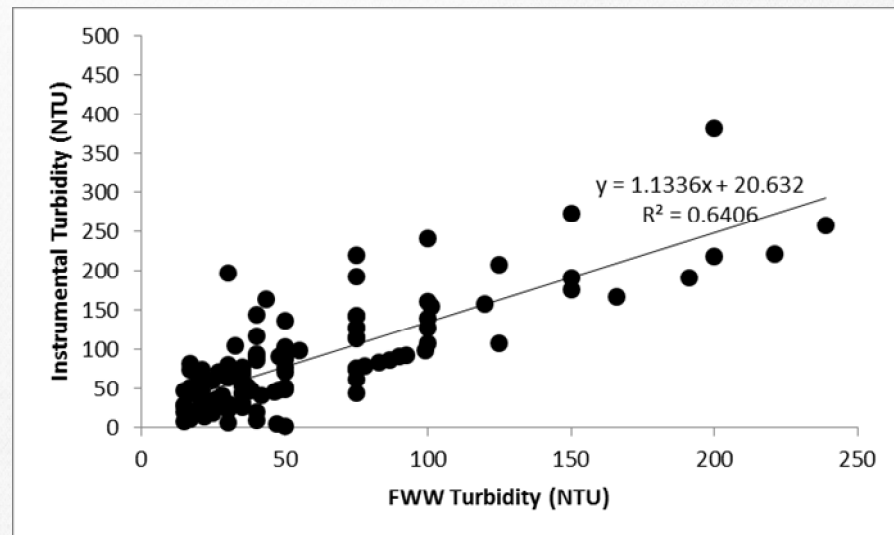
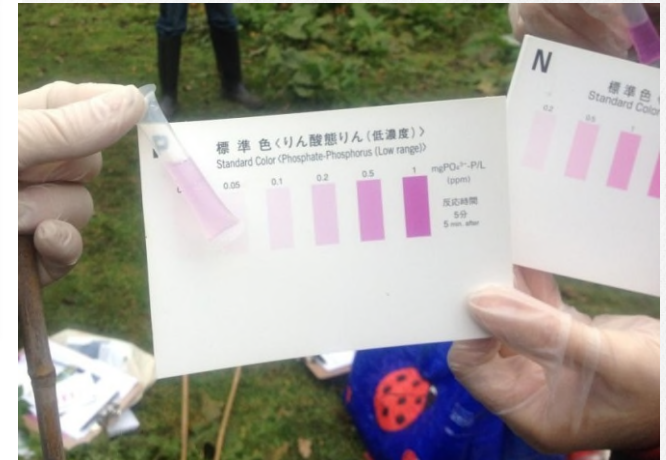
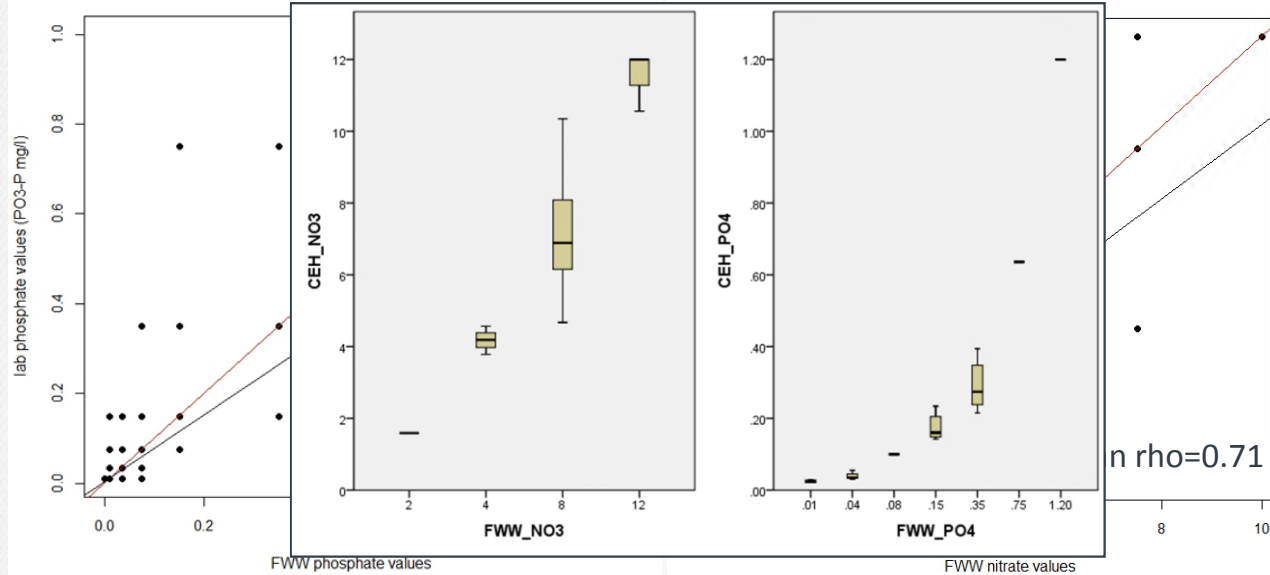
- Collected over 13,000 data sets



ROBUST METHODOLOGY



Line of equality, regression line.



GLOBAL RESEARCH RESULTS

As of May 2016:

Castilla, E. P., Cunha, D. G. F., Lee, F. W. F., Loiselle, S., Ho, K. C., & Hall, C. (2015). Quantification of phytoplankton bloom dynamics by citizen scientists in urban and peri-urban environments. *Environmental Monitoring and Assessment*, 187(11). DOI: 10.1007/s10661-015-4912-9

Yan, W., Hutchins, M., Loiselle, S. A. and Hall, C. An informatics approach for smart evaluation of water quality-related ecosystem services. *Annals of Data Science*, 9208 DOI: 10.1007/s40745-015-0067-3

Cunha, D. G. F., Marques, J. F., de Resende, J. C., de Falco, P.B., de Souza C.M. and Loiselle, S. A. Citizen science participation in research in the environmental sciences. *Ecology and Society* (submitted)

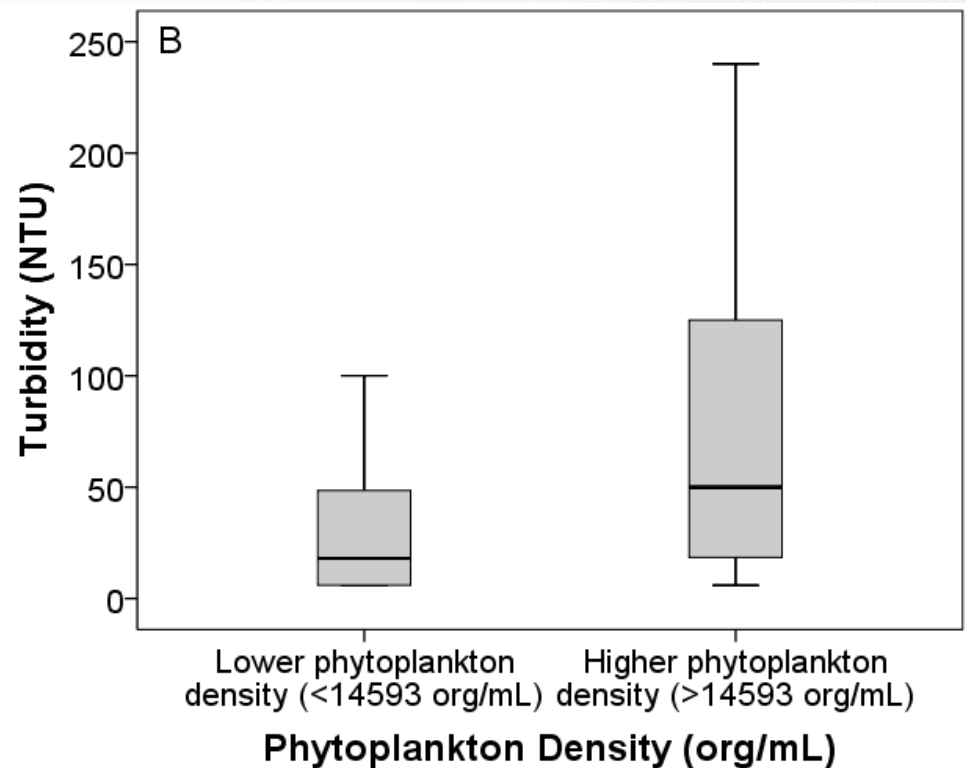
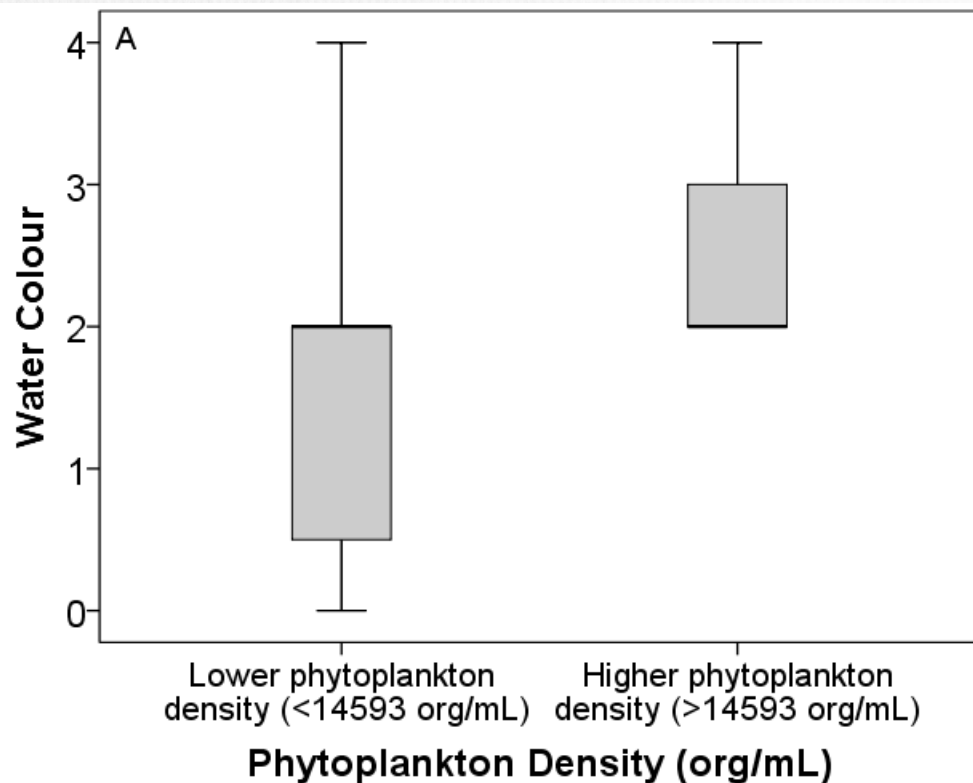
GLOBAL RESULTS

FWW data can help identify potentially harmful algal blooms

3. Water Quality – Observations

a) Estimate the water colour:

☐ Colourless ☐ Yellow ☐ Brown ☐ Green ☐ Other



Castilla et al. EMAS 2015

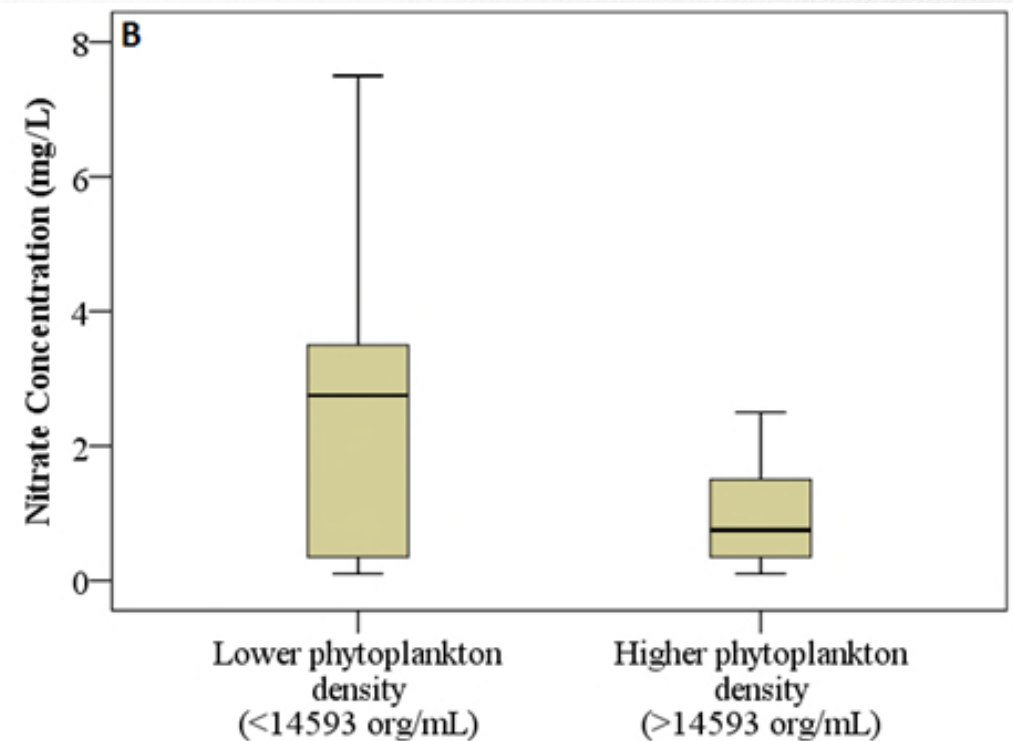
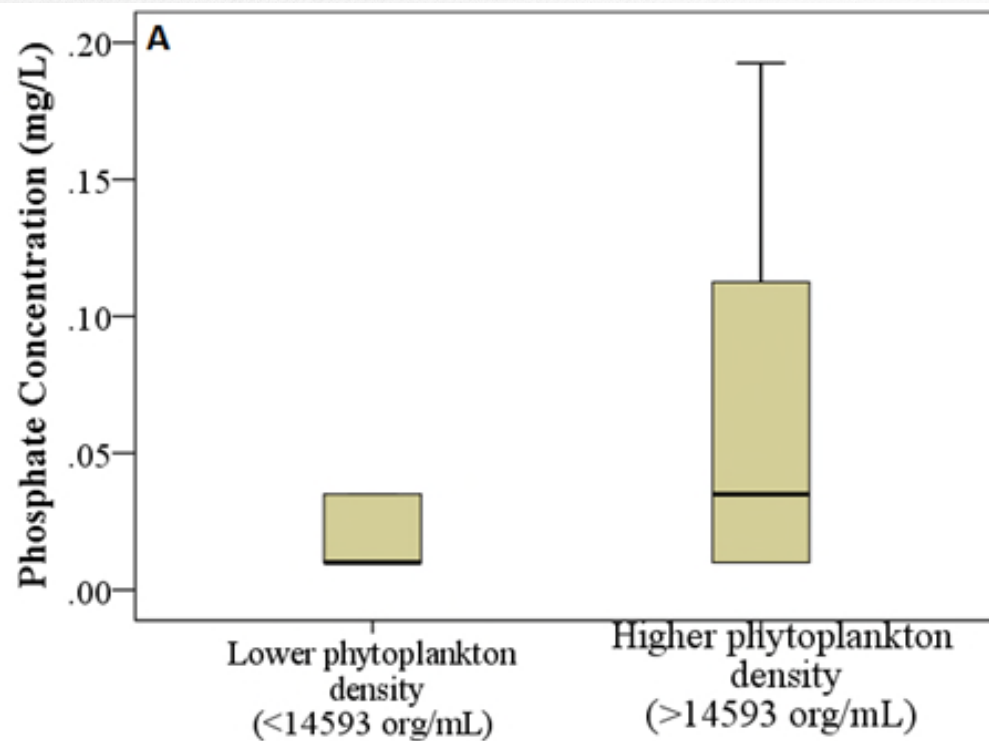
GLOBAL RESULTS

FWW data is robust

4. Water Quality – Nutrients in parts per million (ppm)

Nitrate ☐ <0.2 ☐ 0.2-0.5 ☐ 0.5-1 ☐ 1-2 ☐ 2-5 ☐ 5-10 ☐ >10

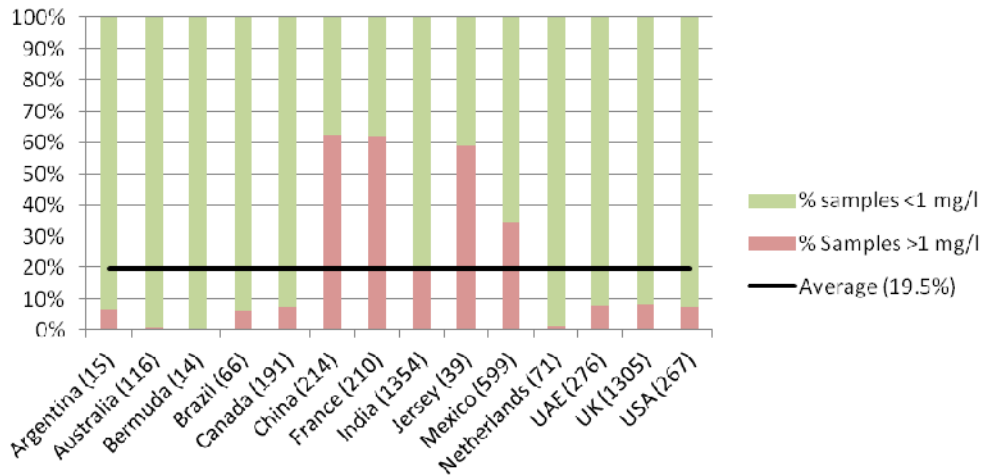
Phosphate ☐ <0.02 ☐ 0.02-0.05 ☐ 0.05-0.1 ☐ 0.1-0.2 ☐ 0.2-0.5 ☐ 0.5-1 ☐ >1



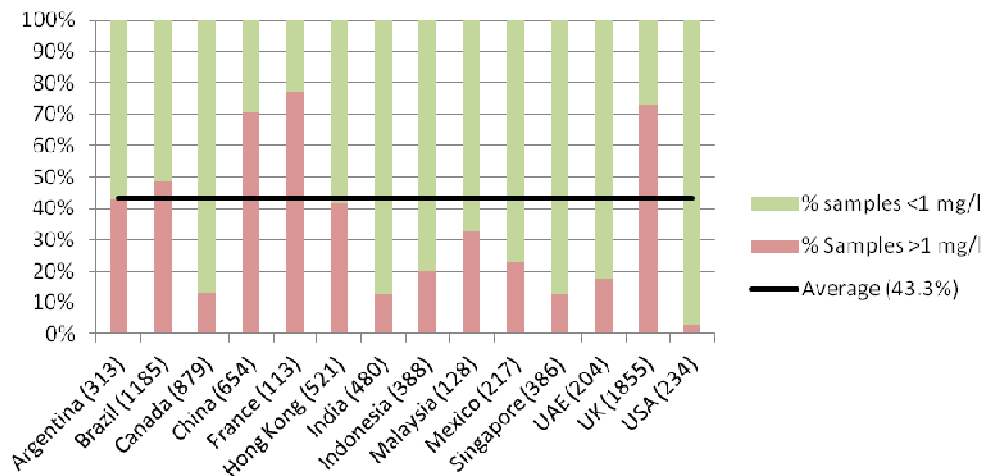
Castilla et al. EMAS 2015

GLOBAL RESEARCH RESULTS

Measurements above risk threshold
(Nitrate in still water)



Measurements above risk threshold
(Nitrate in flowing water)

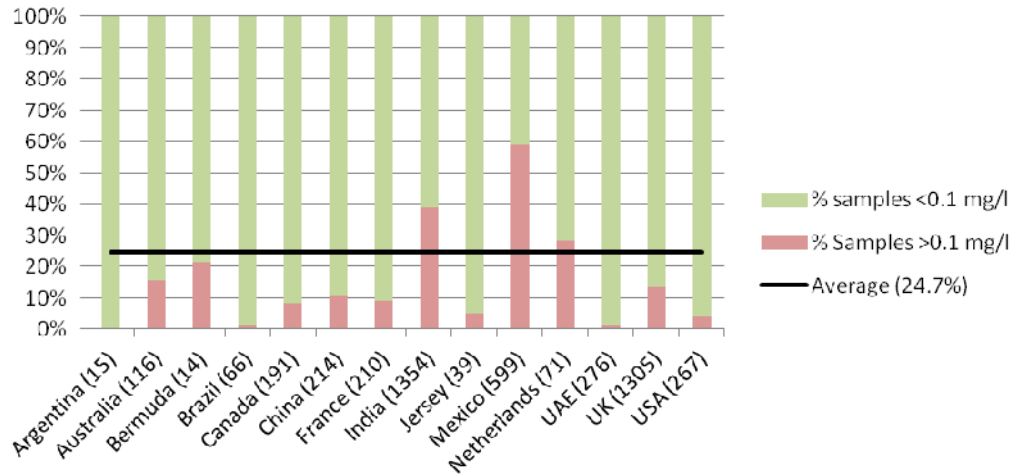


Some key messages (NO₃):

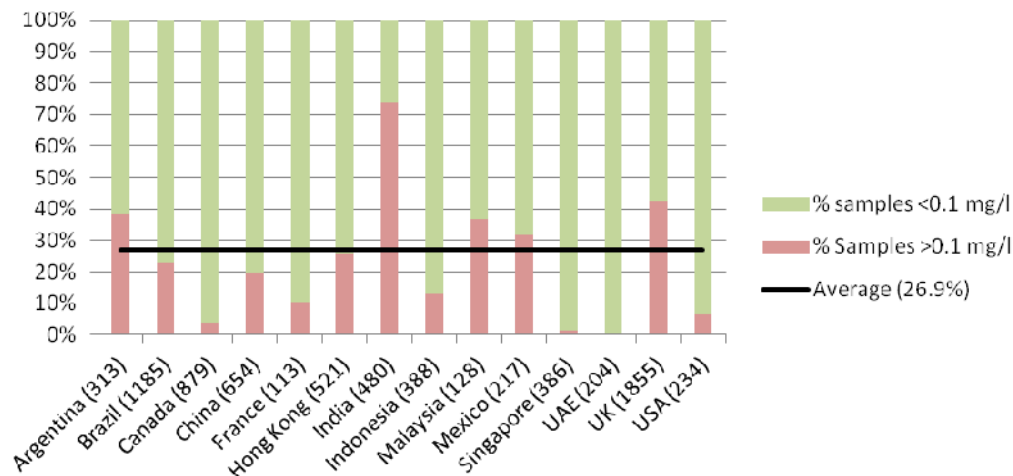
- 1 in 5 still and 1 in 2 flowing samples water > 1mg/l NO₃
- Situation appears particularly an issue in China and for rivers in the UK and France
- Relatively low concentrations in Canadian and in Indian rivers
- But only using samples not sites

GLOBAL RESEARCH RESULTS

Measurements above risk threshold
(Phosphate in still water)



Measurements above risk threshold
(Phosphate in flowing water)

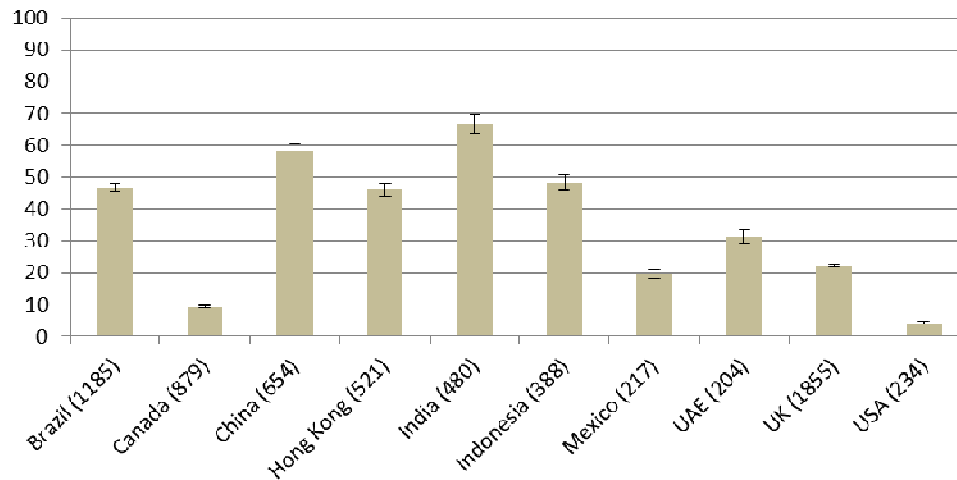


Some key messages (PO_4^{3-}):

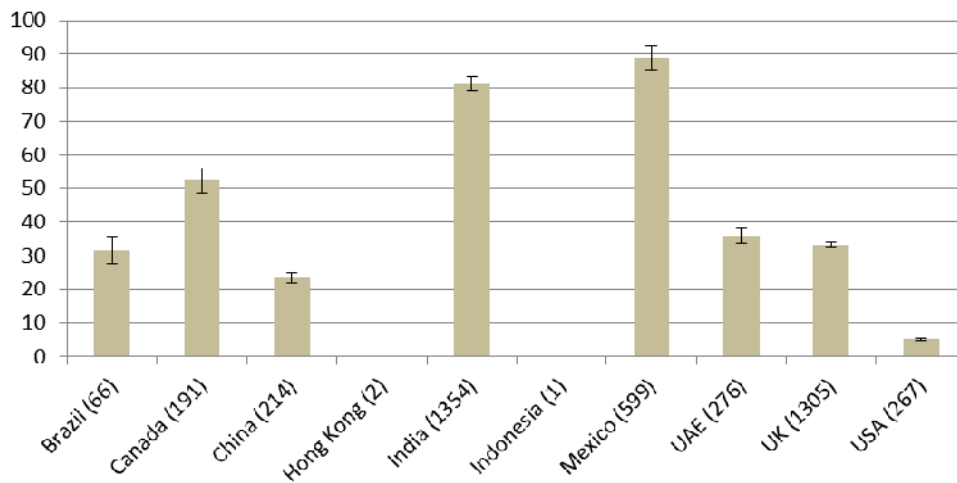
- 1 in 4 still and flowing water samples $> 0.1 \text{ mg/l } \text{PO}_4^{3-}$
- Situation appears particularly an issue in India, Mexico and in UK flowing waters
- Relatively low concentrations in China and in Indian rivers
- But only using samples not sites

GLOBAL RESULTS

**Average turbidity (NTU), water colour green
(flowing water)**



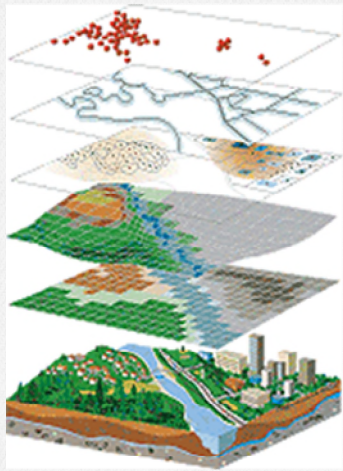
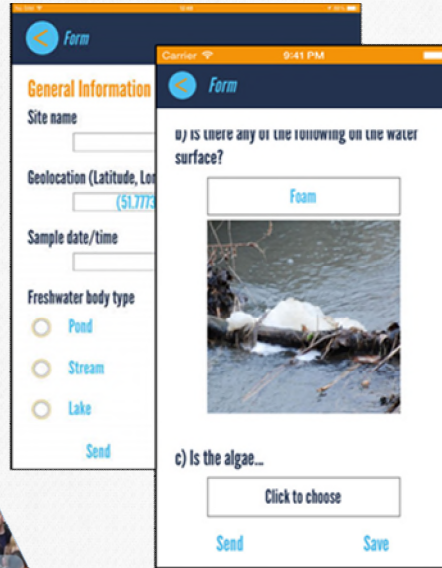
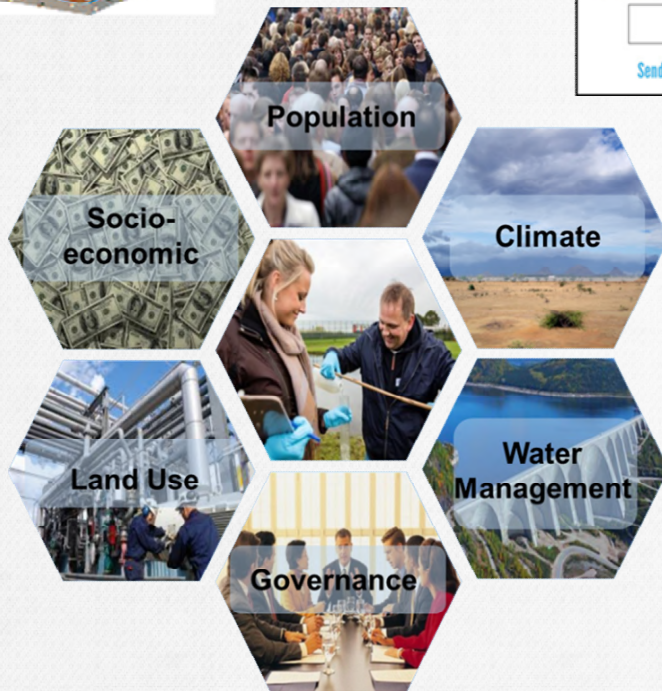
**Average turbidity (NTU), water colour green
(still water)**



Some key messages (turbidity):

- 1 in 10 still and flowing water samples >46NTU (Pruitt et al. 2001)
- Some concerns in Brazil and China flowing waters
- India and Mexico notably more ‘at risk’
- But only using samples not sites
- No algal bloom distinction

ONGOING ANALYSES

- Are small water bodies cleaner?
- Micro vs. macro-scale predictors of water quality
- How complimentary is FWW to regulatory agency data?
- What contributes to citizen scientist survival?
- Temporal water quality trends in lentic systems

THE NEXT STEPS

Environ Monit Assess (2015) 187: 690
DOI 10.1007/s10661-015-4912-9



Quantification of phytoplankton bloom dynamics by citizen scientists in urban and peri-urban environments

Eva Pintado Castilla · Davi Gasparini Fernandes Cunha · Fred Wang Fat Lee · Steven Loisel · Kin Chung Ho · Charlotte Hall

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Abstract Freshwater ecosystems are severely threatened by urban development and agricultural intensification. Increased occurrence of algal blooms is a main issue, and the identification of local dynamics and drivers is hampered by a lack of field data. In this study, data from 13 cities (250 water bodies) were used to examine the capacity of trained community members to assess elevated phytoplankton densities in urban and peri-urban freshwater ecosystems. Coincident nutrient concentrations and land use observations were used to examine possible drivers of algal blooms. Measurements made by participants showed a good relationship to standard laboratory measurements of phytoplankton density, in particular in pond and lake ecosystems. Links between high phytoplankton density and nutrients (mainly phosphate) were observed. Microscale observations of pollution sources and catchment scale estimates of land cover both influenced the occurrence of algal blooms. The acquisition of environmental data by

committed and trained community members represents a major opportunity to support agency monitoring programmes and to complement field campaigns in the study of catchment dynamics.

Keywords Phytoplankton · Algal bloom monitoring · Urban ecosystems · Citizen science

Introduction

Freshwater systems are highly threatened by a range of anthropogenic activities including intensive agriculture, urbanisation, industrialisation and land cover change (Meybeck 2003). These pressures affect all ecosystem services provided by these systems, including water supply for human consumption, food production and industry, fishing, flood protection and recreational activities (Vorosmarty et al. 2005; Waltham et al. 2014). Vorosmarty et al. (2010) found that almost 80 % of the world's population live in areas with high risk for human water security and biodiversity.

The growing human population combined with the increasing tendency to live in cities has led to an increase in the number of streams flowing through urbanised areas (Meyer et al. 2005). The effects of urbanisation on water bodies have been described as "urban stream syndrome" and include alterations in geomorphology and hydrology, decrease in biodiversity, dominance of toxic, tolerant and invasive species and increase in the concentrations of organic compounds, nutrients and algal biomass (Meyer et al. 2005; Walsh

Electronic supplementary material The online version of this article (doi:10.1007/s10661-015-4912-9) contains supplementary material, which is available to authorized users.

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Blog 20160316 - Microsoft Word




Centre for Ecology & Hydrology
NATURAL ENVIRONMENT RESEARCH COUNCIL



CEH Science News Blog

Thursday, 21 August 2014

CEH scientists collaborating with global freshwater citizen science programme

CEH scientists working on a project investigating water pollution in urban areas have teamed up with Earthwatch to train citizen scientists in carrying out water quality monitoring. The collaboration has come about via Earthwatch's *Freshwater Watch* programme, which aims to study fresh water quality around the globe by engaging employees from participating organisations as citizen scientists.

The *POLLCURB* project, led by CEH, is looking at how water pollution relates to change in urban areas, in particular change brought about by population growth, and what it may mean for water quality and quantity in the future.

POLLCURB is collaborating with the Earthwatch programme by training citizen scientists, in this case employees from Shell, to monitor water quality in the river Thames and two of its tributaries, the Mole and Embur, using a handheld multiparameter probe.



CEH's Mike Hutchins (centre) teaching participants how to use the probe. Photo: Richard Sylvester / Earthwatch.

Dr Mike Hutchins of the Centre for Ecology & Hydrology is lead investigator on *POLLCURB*. At a recent citizen science training day at Wimbledon Common, Mike gave an overview of the project

About us

 **CEH News**

This is the official blog of the Centre for Ecology & Hydrology. It is intended to provide more information about our science and the work of CEH scientists.

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